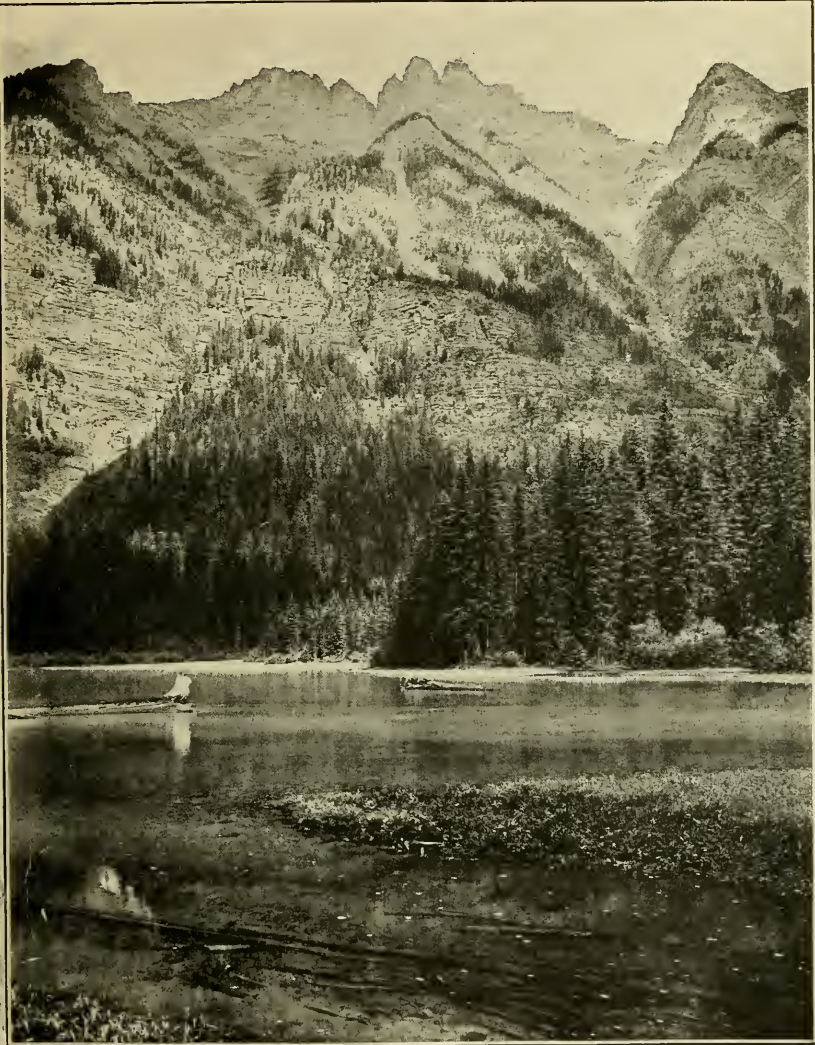


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SOME LAKES OF GLACIER NATIONAL PARK

by Morton J. Elvord



DEPARTMENT OF THE INTERIOR

1912



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SOME LAKES OF GLACIER NATIONAL PARK.

By MORTON J. ELROD, *University of Montana.*

INTRODUCTION.

During the summers of 1909, 1910, and 1911 I spent considerable time in the study of the lakes of the Glacier Park. The object was to make observations in regard to their depth, and, in the case of those lakes which do not now contain fish, to make a study of the microscopic life as a source of fish food, and, in addition, to make soundings to determine the depth of the water, so as to arrive at a fairly satisfactory conclusion of those lakes as producers of fish.

Most of the larger lakes are connected with rivers through creeks which have no high falls, and which consequently admit fish from the rivers to the lakes. Many of the lakes are small. Some, however, are of considerable size and appear to be capable of supplying food for large numbers of fish.

The method of taking soundings was as follows: An ordinary plumber's bob of lead or iron was used, with several hundred feet of heavy cord of the kind ordinarily used for trolling. This cord was passed through a piece of apparatus such as is used for measuring wire in installing telephones and telegraphs. All that was necessary was to adjust the apparatus on the edge of the boat and let the cord run out until the bottom was struck, then read the depth on the dial. The method of securing depth by this process is quite accurate if the water is still, and there is no question whatever about determining when the lead strikes the bottom of a lake.

The life of the lakes was determined by using a surface net made of No. 20 silk bolting cloth of the finest mesh procurable, such as is used in flour mills. Attached to this was a little brass bucket with little windows, which were covered with the same kind of silk cloth. The water was screened through the net and the specimens collected in the little bucket at the end, the whole thing being shaped like a funnel. The bucket is detachable, by this means making it possible to collect the life from a large quantity of water into a small space and preserve it for future study. A wooden plug was inserted in a small hole in the bottom of the bucket, and on removal of this the

contents were easily transferred into a small vial or glass bottle. This net was dragged behind the boat for an indefinite distance at various places in the different lakes, and the contents in each case preserved and properly labeled. A second net consisted of a rectangular iron frame, with a silk cloth of larger mesh, intended to collect larger material, both from the surface and from the bottom. The mesh is sufficiently large to allow the passage through it of mud and the small specimens, and was intended only for the collection of the larger forms of life. By means of a rope this was allowed to drop to the bottom, if the lake was not too deep, or along the surface, or at a depth from the surface, as desired. This material also was collected and preserved for future study.



LAKE McDONALD.

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Most of the field work was done from a canvas boat, carried from place to place on a pack horse, as no other form of boat could be so transported: in some places wooded boats were available.

Owing to the large number of lakes in the park and of the difficulty of reaching so many in the short space of time that could be given, there are still many left to be studied. Some of these are easily accessible to the tourist and are doubtless capable of supplying food to an abundance of fish life. The park will be much more interesting if most of these lakes are stocked with fish; but to do so will require some knowledge of their depth, the quantity of life the water contains, and general information as to their surroundings, accessibility, insect life, and the like.

LAKE McDONALD.

Lake McDonald (altitude 3,144 feet), near Belton, is the lake seen by the greatest number of tourists at the present time. The lower end of this lake is about $2\frac{1}{2}$ miles from Belton, on the Great Northern Railroad, from which place an excellent road has been constructed. Launches make regular trips on this lake and rowboats can be hired.

This lake is $9\frac{1}{2}$ miles in length and has a width of about a mile. Until recently it has been considered bottomless, but a series of soundings made across the lake, opposite Glacier Hotel at the upper end, gave the following results:

Depths in Lake McDonald.

	Feet.
About 300 yards offshore-----	271
About third way across-----	383
Halfway across-----	308
Three-fourths distance across-----	387
300 yards from west shore-----	260
Deep hole reported at upper end midway between the high mountains-----	359



AVALANCHE LAKE.

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AVALANCHE LAKE.

This lake (altitude, 3,865 feet) lies in Avalanche Basin, at the foot of tremendous cliffs, over which come the waters formed by the melting of the snow and ice of Sperry Glacier. It is hemmed in on all sides, except at the outlet, by high mountains. The forests come down to the water's edge. At the upper end of the lake is an open space of a mile or so, kept free from timber, apparently, by avalanches falling from the heights above. At this end there is an area that is comparatively level and open. Stretches of dense brush extend to the foot of the cliff and part of the way up the sides, wherever footing

is afforded. The lake is fed almost entirely from the streams of the glacier above. Its outlet is into McDonald Creek. This creek runs through a beautiful gorge a greater portion of the way, making one of the most beautiful walks in the entire park.

The lake is elliptical, about a mile long and half as wide. It has a pebbly shore and is a favorite place for anglers. It is apparently full of fish, notwithstanding the fact that it is fished to a greater extent, perhaps, than any other lake of its size in the park. It is a favorite place for tourists and is about 9 miles by trail from Lake McDonald. At the upper end is a beautiful camp site.

The depth at the lower end, as taken August 4, 1910, was but 4 feet. About halfway up the lake the depth was 54 feet; at two-



AVALANCHE LAKE.

Photograph copyrighted by Kiser Photo. Co. for Great Northern Railway.

thirds distance from the lower end, 63 feet; and at the upper end near the shore, 58 feet. The temperature of the water at 3 p. m. on this date was 57° F. The temperature of the air was 70° F.

As will be seen from these figures, the lake is deepest at its upper end. The outlet has been closed by a log jam for many years, as shown by the condition of the logs forming the dam.

At the present time fish ascend the streams above the lake to the foot of the high falls. The microscopic life in the lake is abundant, notwithstanding the fact that the lake is apparently well stocked with fish. The brush and woods adjacent furnish an abundance of insects during the summer months. There are large numbers of in-

sects whose larvæ are aquatic, furnishing food in this manner, and the adult in the deposition of their eggs on the water are captured by the fish, or taken as they fall upon the surface.

Avalanche Lake is typical in size and location of many other lakes in the park that are without fish. Since they do so well in this lake, there can be no doubt but they would do fully as well in some of the other lakes that have never been examined. If plans are made for stocking the lakes, it would be well to consider the question of planting more fish in this body of water. The young fish would have plenty of opportunity to hide, have an abundance of microscopic food, and have an outlet to the larger streams in the park when they reach adult size.

BOWMAN LAKE.

Bowman Lake receives the waters from the high mountains on either side of Brown Pass on the Pacific slope. From the Continental Divide to the upper end of the lake the distance by trail is about 8 miles, through scenery that is wonderfully captivating. The trail follows the lake for its entire length of about $6\frac{1}{2}$ miles. Its width is a half mile or less, narrower next the mountains, wider at the lower end. The elevation of the lake above the sea is 4,020 feet. It is a famous fishing resort, easily accessible, with a fairly good shore line, and open at the lower end. It drains into the Flathead River through Bowman Creek. There is a wagon road leading from the lower end of the lake to Flathead River, along which there is a wagon road extending from Belton to the Kintla Lake region. At the lower end of the lake are big meadows, supplying abundance of food for horses and affording a well-known camping site.

The one sounding made in this lake, at a point about half a mile above the lower end, gave a depth of 90 feet. The temperature of the water at 5 p. m. on August 19, 1910, was 59.5° F. Collections made with net and dredge showed that the lake is well supplied with fish food.

WATERTON LAKE.

Waterton Lake is at the northern end of the park, half in the United States and half in Canada. This lake has been given different names. On the first maps of the district it is called Chief Mountain Lake; on some of the later maps it is called Kootenai Lake, which is also the name given by some of the residents.

This lake is easily approachable by road from the Canadian end. From Lake McDonald it is reached by trail, the distance being about 33 miles. It is 10 or 12 miles long and has an average width of perhaps half a mile. Its altitude is 4,166 feet. Soundings were made on this lake on August 17, 1910. The temperature of the water at 1.30 p. m. was found to be 56° F., while the temperature of the air at the same time was 62.5° F. Sounding was made 200 feet east of the rocky ledge on the west shore, about 2 miles from the upper end.



GENERAL VIEW OF THE LAKES AND MOUNTAINS, WATERTON LAKE. NORTHERN END OF UPPER LAKE, WHICH IS CROSSED BY THE BOUNDARY.



LAKE ON OLSON CREEK, FROM THE MOUNTAIN SIDE, LOOKING TOWARD MOUNT CLEVELAND, WHICH IS ON THE RIGHT IN THE DISTANCE.

The depth was 210 feet. Another sounding, made approximately the same distance from the upper end and about halfway across, gave a depth of 317 feet. These were the only two soundings made on this lake. The temperature of the water at 8.30 p. m. of August 9, 1911, was 52° F., the air temperature being then 47° F.

LAKE ON OLSON CREEK.

Most of the water from Waterton Lake is received from Little Kootenai Creek. Just before this creek enters the lake it receives the waters of Olson Creek, which comes in from the west. The trail leads up this creek and over Brown Pass to the lakes and streams of the western slope, which drain into the Flathead River. The trail by Olson Creek and over Brown Pass traverses one of the picturesque portions of the park, and will doubtless be visited by many tourists. This will be especially true of those coming in from the Canadian side. On Olson Creek, 3½ miles above Waterton Lake, is a small lake that is unnamed. It is in a beautiful location, in the very heart of magnificent mountains. The altitude is about 5,000 feet. The shore is open and easily accessible.

This lake is fed by streams, heading in the snowbanks of near-by mountains. It is without fish. On Olson Creek, between this lake and Waterton Lake, are numerous falls, up which fish are not able to ascend. The lake is not deep, being only 5 feet at the upper end and 10 feet at the lower. It is situated in a mountain pocket, and has been made by a mass of glacier boulders. This mass extends for a mile or more down the creek, forming a series of falls and cascades, over which the water dashes with great noise.

The temperature of this lake at 5 p. m. on August 11, 1911, was 52° F. in the center and 54° F. near the shore. The air temperature at the same time was 59° F. This and other temperatures here given were taken about 6 inches below the surface.

From observations made by the use of the surface net and the dredge and from the character of the shore line it would seem apparent that fish could do well in this lake. While it may freeze over, and doubtless does freeze over in winter, it would surely not freeze to the bottom, and fish should live during the winter as in any other lake.

There is in it a considerable abundance and variety of microscopic life. One species of water snail is found in considerable abundance. The larvæ of numbers of insects were abundant. The streams which supply the water doubtless carry into it considerable quantities of insect life.

As the northern shore of the lake is open, it is a favorite camping site. Should the lake be stocked with fish it would make the region doubly interesting to tourists. Furthermore, the fish could easily ascend the streams to a distance of several miles.



LAKE SOUTHEAST OF BROWN PASS.



MCDERMOTT LAKE, MOUNT GOULD, MOUNT POLLOCK, AND ALLEN MOUNTAIN.

LAKE SOUTHEAST OF BROWN PASS.

On Olson Creek, about 2 miles above the lake last described, is another unnamed lake.

This lake is some 5 or 6 miles from Waterton Lake, and lies at the foot of tremendous cliffs, in a charming spot, close to the trail. Its altitude is about 5,250 feet. It is fed by two streams. One comes from the glacier above, falls over the cliffs, 1,100 feet high, by seven streams, and presents a most charming picture. The other brings the water from the eastern slope of the Continental Divide at Brown Pass, several miles farther up the trail. This lake is connected with the lake last described by Olson Creek. Fish placed in either lake could easily pass, in a short time, to the other.

Soundings show the lake to be 75 feet deep in the middle, with a depth of 30 feet at the upper end. Apparently it is shaped like a big bowl. It is oval, perhaps a mile in length and not quite as wide. Its surface area is probably a little more than that of lake last described. Its temperature at 2 p. m. on August 12, 1911, was 53° F., the air temperature at the same time being 67° F. The lake contains considerable quantities of microscopic life, and is a fine haven for fish in winter. Without doubt they would do well if the lake were stocked. Moreover, they could ascend the inlet of the lake that brings the water from Brown Pass.

The same remarks that were made concerning insect life for the lake last described will apply for this lake. It would seem to me to be highly desirable to have fish placed in either or both of these beautiful bodies of water. If placed in one they would soon be in the other.

McDERMOTT AND ALTYN LAKES.

These lakes lie between Grinnell Mountain on the west and Allen Mountain on the east. They extend northeast and southwest for a distance of 3 or 4 miles, and are connected by a creek less than a quarter mile in length. The elevation of McDermott Lake is 4,861 feet; Altyn Lake is slightly higher. Whatever deductions or conclusions are made for one lake will apply to the other.

Observations were made on McDermott Lake only. The shore of the lake is open, free, and easily accessible. The trail passes close to the lake at the lower end. A logging camp and sawmill was formerly located here, but are now abandoned. Fire has destroyed the timber so that there is a good, open site for camping, with splendid views of the lake and mountains. The outlet of this lake is a series of cascades, with a total fall of about 90 feet in a quarter of a mile. To the foot of this cascade fish from the streams below make their way, but none have ascended to the waters of the lake above. This cascade, with the mountains behind for a back-

ground, is one of the beauty spots of the park, and the portion of the lake here described is one where tourists will delight to linger. At the upper portion of the lake the slopes are partly wooded and partly open. The outline is quite irregular, and there are many little sheltered coves, where game birds may hide, and where young fish may escape the larger ones.

A sounding, 330 feet from the shore opposite the cabins, showed a depth of 16 feet. A second sounding, half way between the cabins and the bare rock at the foot of the lake, showed 36 feet. One-third of the way up the lake the depth was 32 feet. In the narrow and



GRINNELL LAKE, GRINNELL GLACIER AND AMPHITHEATER.

shallow places the depth was only 4 feet; at the upper end it was 7 feet. No soundings were taken in Altyn Lake

The temperature of the water was 58° F., and the temperature of the air 63° F. Collections with net and dredge produced a greater quantity of fish food than has been found in any of the lakes that have been studied in the park. Microscopic life upon which the small fish must feed was in great abundance. Everywhere on the bottom, among the weeds, and close to the mud were great numbers of fresh water shrimp, the adults being about 1 inch in length. With such an abundance of fish food, there is every

reason why this lake should be stocked at an early date with a good supply of young fish.

The lake lies in a depression at the edge of the mountains. Its outlet is blocked by a layer of bedrock, which the waters of the lake are slowly wearing away from year to year. Immediately below the lake the plains country begins. Transportation of fish to the lake would be quite easy, as a good wagon road extends from Babb, at the mouth of Swiftcurrent Creek, to the lake.

McDermott Lake receives its waters from the Grinnell Glacier country, from Swiftcurrent Pass, including a glacier on either side of the pass, and from Iceberg Lake. If fish were introduced into McDermott Lake, they would be given access to the streams leading up to the mountains in these three directions. Between McDermott Lake and Swiftcurrent Pass is a series of smaller and shallow lakes, which were not studied but which have a slightly greater elevation than McDermott Lake. Whether there are falls between McDermott Lake and these smaller lakes in the direction of Swiftcurrent Pass the writer does not know. If there are none fish will, of course, have several miles of creek and lakes where they could secure food. It would be only a short distance to transport fish to the upper lakes and stock them also. As they, too, are by the side of the trail, and as large numbers of people will doubtless wish to go over Swiftcurrent Pass and see the beautiful country adjacent thereto, it is highly desirable that fish be planted in these waters wherever they may be able to live.

GRINNELL LAKE.

Grinnell Lake lies about a mile above Altyn Lake and has the same general outline, location, and appearance with respect to mountains as Avalanche and Gunsight Lakes. It lies at the foot of the tremendous cliffs of Gould Mountain, and receives the waters that come from the melting ice from Grinnell Glacier and from a portion of the slopes of Grinnell Mountain. Its elevation is about 5,050 feet. As the trail to Grinnell Lake was not good and was difficult for pack horses the canvas boat, by means of which the soundings were made, was not taken to the lake. The surface net was thrown into the water, and some observations of the life in the lake were made by dragging the net around through the water from horseback, near the lower end. Such observations are not conclusive, of course, and are given merely for what they are worth. They serve to show, however, that the lake is well supplied with microscopic life, and further observations, when the boat can be transported to the waters, will doubtless show as much living material as in Gunsight and Avalanche Lakes. Moreover, fish planted in McDermott or Altyn



GRINNELL LAKE AND GOULD MOUNTAIN FROM GRINNELL MOUNTAIN.
Photograph copyrighted by Kiser Photo. Co. for Great Northern Railway.

Lakes would doubtless have no difficulty whatever in reaching Grinnell Lake, as the distance is short.

The lower end of the lake is open and parklike, but marshy, and the lake at this portion appears to be quite shallow. It was possible to ride out into the water a distance of a hundred feet or more before the water reached the horse's belly.

From the contour of the country it would seem that this lake is perhaps like some of the others mentioned in this report—deepest at its upper end. The shore next to Gould Mountain is very precipitous and is nothing but a mass of broken rock or talus slope that has fallen from the mountain and is almost devoid of vegetation. The opposite shore, on the Grinnell Mountain side, is a dense mass of brush.

At the upper end the waters from Grinnell Glacier fall over the high cliffs with a deafening noise, presenting a beautiful sight. The views from the lower end of the lake are as beautiful and imposing as any to be found in the park. With a good trail to the upper end of the lake this would be a favorite place for tourists, perhaps as attractive as Avalanche Lake, although more remote from the points of entrance. Such a trail will doubtless be made in the near future, and when the lake is opened up to the public it will be doubly attractive if stocked with fish.

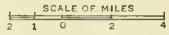
ICEBERG LAKE.

Iceberg Lake lies at the foot of the towering cliffs of Wilbur Mountain, the Continental Divide, and the high cliffs at Ahern Pass. The precipices above this lake are more tremendous and imposing than any the writer has seen in the park. It lies on the north side of Wilbur, on the east side of the Continental Divide, and on the south of the unnamed mountains of Ahern Pass. As a consequence the sun shines in this pocket for only a short portion of the year, and the accumulated snow has little chance to melt. The distance from the lake surface to the top of the cliffs above is over 3,000 feet. The lake is not large, covering, perhaps, less than a square mile of surface. Its elevation is 6,100 feet. At the outlet is a series of falls, which make it impossible for fish from below to ascend to the lake, and which would lock in the lake any fish that might be planted therein.

While this lake has a location which given it great interest, and the surroundings are considered by many to be the most impressive in the park, it does not seem advisable to go to the trouble of planting it with fish, since its surface is free from ice for only a short time in the year, and fish planted there would be completely landlocked, and could not travel from the lake proper a distance of more than a quarter of a mile. If fish are planted in McDermott Lake, as has been suggested, they could migrate up the stream to within a comparatively short distance of Iceberg Lake.



TRAVEL-GUIDE MAP
OF THE
GLACIER NATIONAL PARK
MONTANA



After Topographic Map of Glacier National Park by the U. S. Geological Survey.

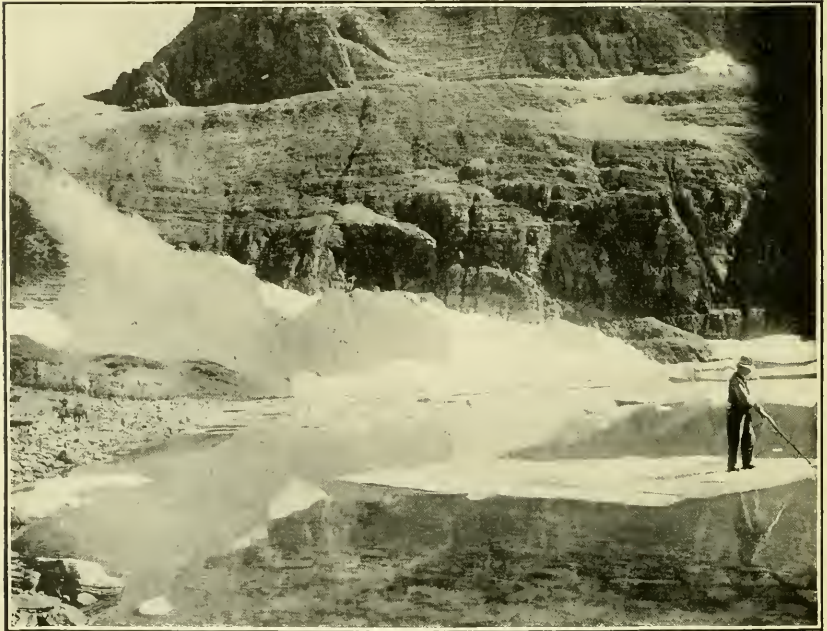
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ICEBERG LAKE.

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ICEBERG LAKE (IN AUGUST), LOOKING TOWARD THE CLIFFS OF WILBUR MOUNTAIN.

ST. MARY LAKES.

Lower St. Mary Lake lies outside Glacier Park, in the Blackfoot Indian Reservation. No soundings were made in this lake, nor was work of any kind done on it. Upper St. Mary lies wholly within the park. The elevation of the lower lake is 4,460 feet; that of the upper lake is 4,472 feet. Upper St. Mary Lake has a general direction of northeast and southwest, separated from the lower lake by a mile or more of river. This river is shallow and easily forded, either with horses or vehicles. The old trail, now made into a wagon road, crosses the stream at about the boundary line of the park, and



UPPER LAKE ST. MARY FROM UPPER END; RED EAGLE MOUNTAIN ON RIGHT;
DIVIDE MOUNTAIN IN DISTANCE.

Photograph copyrighted by Kiser Photo. Co. for Great Northern Railway.

follows the northern shore of the lake from the lower end to the upper, a distance of 12 miles by water and considerably more by trail. The wagon road extends only to the narrows, which is about half way up the lake. Above the narrows the trail climbs almost to the foot of the rocks of Goat Mountain and later descends nearly to the lake level.

The only work done on Upper St. Mary Lake was the taking of a series of soundings, extending from the narrows to the upper end. Through the courtesy of Mr. W. J. Hillegoss, of the Great Northern

Railway, I was enabled to make use of the boat, which had been placed upon the lake the day before. The record of the soundings taken is as follows: A short distance below the narrows, in the middle of the lake, 150 feet; in the narrows, opposite the rocks, which are situated on the north side, 200 feet; out from the rocks 80 feet; half way from the upper end to the upper narrows, 166 feet; 100 yards off the rocks which are on the south side of the upper narrows, 137 feet; opposite the little creek on the south side of the lake, just west of Red Eagle, 123 feet; about the middle of the lake, half



HEAD OF UPPER LAKE ST. MARY FROM THE UPPER NARROWS.

Photograph copyrighted by Kiser Photo. Co. for Great Northern Railway.

way between the upper and middle narrows, 292 feet. The temperature of the water was 56° F. These soundings were taken August 22, 1911.

One of the gentlemen at the camp stated that a few days before my arrival a Mackinaw Lake trout had been taken by a trolling line. The weight of this fish was 18 pounds. He also stated that some time prior one had been taken which weighed 30 pounds. Undoubtedly the lake is full of fish, many of them of good size. These can migrate only a short distance up the creek from the lake, as they are stopped by the falls. The introduction of fish into Gunsight Lake above would give the fish access to the streams at the foot of the Continental Divide.

GUNSIGHT LAKE.

This lake lies on the northern side of Gunsight Pass, its upper end reaching almost to the foot of the cliffs of the pass. It trends north-east and southwest, is about a mile in length and perhaps half as wide, and is oval or elliptical, as are most of the smaller lakes in the park. Its elevation is 5,276 feet. Gunsight Mountain is on the west, Jackson Mountain on the south. At the upper end of the lake is a small, open stretch less than half a mile long between the lake and the cliffs. On the Gunsight side of the lake the timber and brush come down to the water's edge. On the Jackson Mountain side the



GUNSIGHT LAKE AND PACK TRAIN ON EAST SIDE OF GUNSIGHT PASS, PIEGAN MOUNTAIN, AND GOING-TO-SUN MOUNTAIN IN DISTANCE.

Photograph copyrighted by Kiser Photo. Co. for Great Northern Railway.

shores along the lower half are quite dense with brush; along the upper half they are free. The remainder of the lake is open and has a good, pebbly shore, making the waters easy of access. The outlet is to the St. Mary River, by which the waters reach the Upper St. Mary Lake, 8 or 9 miles by trail. In this distance there are numerous waterfalls; how many has not been determined. There are enough, however, to prevent the ascent of fish from Upper St. Mary Lake to Gunsight Lake.

This lake is familiar to all those who have traveled over Gunsight Pass, as the trail climbs the steep slope above the lake, and the lake is constantly in view during the ascent of the traveler over the pass

or during the descent from the pass to the beautiful camp site at the foot of the lake.

At the lower end of the lake the country opens out into a wide park, thinly timbered with beautiful open stretches here and there and with many dense masses of brush.

The lake is fed by numerous streams, probably 15 or 20 at different times, which come from the snow banks and glaciers lying on the slopes of the mountains far above. As a result they come abruptly into the lake and afford no opportunity for the ascent of fish to any distance.

St. Mary River, which is the outlet of the lake, receives the streams which come from the Blackfoot Glacier, making a network of small streams through the large and open park country, which extends for miles.

The water is usually turbid, due to the sediment brought down from the glaciers. Sometimes it is of a deep pea-green color; at other times the green color is much lighter. Sometimes streams of milky-looking water may be seen extending out into the green, showing where the glacier stream is flowing out into the lake and mixing with the lake water.

Soundings of this lake and collections were made on August 23, 1911. One hundred yards from the shore at the upper end the depth was 63 feet; one-third of the way down it was 42 feet; halfway down, 32 feet; three-quarters of the way down, 16 feet.

The temperature of the water at 11.30 a. m. was 53° F. and the temperature of the air at the same hour was 68° F.

From these figures it will be seen that Gunsight Lake, like Avalanche, is deepest at its upper end. It has about the same location with respect to mountains that Avalanche has, and apparently would make as good a home for fish, although they would be prohibited by the falls from migrating to the streams below and would be somewhat landlocked. Still, they would have an abundance of room for movement and would have miles and miles of streams which would give a big supply of insect food.

It would seem that this lake should, by all means, be stocked with fish. Tourists will camp on its shore in great numbers. The magnificent mountains, the glaciers, and fish in the stream and lake near camp would make a fairyland for those who will visit this region.

The net and dredge show that the lake is well supplied with the microscopic life which is necessary for the growth of small fish, and the streams coming into the lake will doubtless carry considerable quantities of fish food. The wooded and brushy shores will give a good supply of insect food, and this will be greatly increased by the insects that will fall into the streams from the brushy sides of the many creeks.



GUNSIGHT LAKE NORTHEAST FROM GUNSIGHT PASS.

Photograph copyrighted by Kiser Photo. Co. for Great Northern Railway.

LAKE SOUTHWEST OF GUNSIGHT PASS.

This lake lies at the foot of Gunsight Pass, on the Pacific side of the mountains. It has an elevation of 5,914 feet, and is therefore 638 feet higher than Gunsight.

The traveler standing at the summit of Gunsight Pass can see Gunsight Lake and this lake without changing his position, except to face about from the northeast to the southwest. Gunsight Lake has been described previously. The upper end of this lake touches the precipitous sides of Gunsight Pass. The lake is fed mainly by a stream of water coming down from the region of the pass. The stream comes from melting glaciers on either side. The stream makes a beautiful waterfall, unnamed. The trail passes the foot of this waterfall, giving the traveler a commanding view. The view of the lake from the pass and from any portion of the trail between the pass and the lake is exceptionally fine. The trail leads down to the edge of the lake. There is an excellent camping place, with plenty of wood and water and an abundance of feed for a goodly number of horses.

On the eastern side or shore of the lake the cliffs of Jackson Mountain come abruptly to the water, and on that side the water is doubtless very deep. On the opposite shore is a level stretch which has been mentioned as a camping place. Back of this rise the abrupt red cliffs of Gunsight Mountain. Over these a small stream of water, coming from a hidden glacier, falls over the precipitous rocks and disappears in spray before reaching the bottom. At the lower end there is a stream perhaps a quarter of a mile in length, winding back and forth over the ledges of rock, and finally falling over the cliffs 1,700 feet into a second lake below. This lake is therefore without streams of any consequence, either as outlet or inlet.

Collections were made here on September 5, 1909, and on August 23, 1911. The results show that the lake is not only deep, but full of microscopic life. The soundings were as follows: 200 yards from shore, at the upper end, 88 feet; halfway down in the middle of the lake, 118 feet; a little less than two-thirds of the way down, 244 feet. The temperature of the water was 49° F., temperature of the air 52° F., at 7.30 p. m.

It thus appears that this lake is like an immense bowl, without streams of any consequence as inlet or outlet, as before mentioned. A single haul of the surface net in the middle of the lake, where the water is deepest, produced an immense quantity of microscopic life. The mass of material was colored blood red, owing to the great quantities of red entomostraca. When we consider that the lake is oval, a mile long and about half a mile wide, with a depth of 244 feet, possibly still deeper at the lower end, we may conclude that

the great amount of fish food in such a large body of water would supply large numbers of fish with plenty to eat. It is true that fish would be landlocked, and would be confined to the waters of the lake. It is also true that not so many insects would be supplied as is the case with the other lakes mentioned, because of the absence of streams at the inlet and outlet. As the prevailing direction of the wind is from the south and southwest, considerable quantities of insect food from the regions below and near by, would fall into the water. Also considerable quantities of food would be carried down from the heights above by the streams mentioned.



LAKE SOUTHWEST OF GUNSIGHT PASS.

It might be urged that the elevation of the lake would be too high to support fish life, or that the lake might freeze early in the fall and thaw out late in the spring, but the location of this body of water is such that the reverse is the case. It lies on the southern face of the Continental Divide, and receives the warm rays of the sun every day in the year when the sun shines, which is not true of most of the other lakes mentioned. With the high cliffs of Jackson on the east and those of Gunsight on the west, the sun will not strike the waters of the lake early in the morning and will cease to touch it early in the afternoon; but, during the middle and warmer portion of the day the surface of the lake will receive the full rays of the sun, with no obstruction whatever. Moreover, owing to this

location the snow which will accumulate on the cliffs on either side of the lake will be melted early in the spring by the warm rays, very much earlier than would be the case on the opposite side of the divide, above Gunsight Lake. And again, as stated, the prevailing winds are from the south or southwest. Consequently the warm air from the lower regions will be carried upwards and assist in melting the snow and in warming the waters. We know that this is true in other places in the mountains that have a similar location, and consequently it must be true for this lake. Therefore, although this lake has an elevation of 638 feet above Gunsight Lake, it seems quite certain that it will have as much open season as will the lake at the opposite side of the range. Moreover, it has much greater depth, and this greater depth will give the fish greater room for activity, and will make possible the growth of much larger amount of life for food.

The shore of this lake is certain to be an attractive place for tourists. The scenery in every direction is very impressive, and if the lake is supplied with fish, it will have an additional charm. When the travel in the park becomes reasonably heavy, the number of fish that will be taken from its waters, should it be stocked, will, no doubt, be sufficient to keep down any excess of fish for the amount of food necessary to maintain their existence.

Everything considered, it would appear that this lake should, without question, be stocked with fish, and it is certain that they would do well until they reach such numbers that the food supply of the lake will be exhausted. It is hardly likely that this will be the case for a long time, and before that time comes the number taken from its waters by campers will be large.

The transportation of fish fry could be made from the St. Mary Lake side or from the Lake McDonald direction. If the fish are brought in from the eastern side of the mountains they could be transported from the Great Northern Railway to Upper St. Mary Lake by wagon or automobile, and up Upper St. Mary Lake by boat. From the upper end of Upper St. Mary Lake to Gunsight Lake is three or four hours' travel by pack horse. At Gunsight Lake they could be cared for and the water changed, ready for transportation over the pass. A pack horse could be taken from Gunsight Lake over the pass and down to the waters of this lake in four hours or less. By this route the fish would be carried by pack horses for not to exceed eight hours, with opportunity to change the water and care for them at the end of four hours.

If fish are brought from Lake McDonald, they could be taken from the Great Northern Railway at Belton, transported over the excellent road from Belton to Lake McDonald, a distance of only a few miles,

then by boat to the upper end of the lake. From Glacier Hotel at the upper end of the lake to Glacier Basin on the trail to Sperry Glacier, the distance is about four hours or less. Here the fish may be cared for and, if desired, a portion could be taken up the trail, about an hour and a half farther, to the small lakes, which lie high up along the trail most traveled at the present time by tourists. From Glacier Basin to this lake is between three and four hours' travel. So that whichever way the fish may be brought in the difficulty of transporting them is not great, and the chances of getting them into the water safely are very good. When once placed in the water they will have no enemies until they reach sufficient size to become enemies to each other.

LAKES SOUTH OF SPERRY GLACIER.

Two beautiful little lakes lie high up on the mountain side at the end of the Sperry Glacier trail. They are 8 or 9 miles distant by trail from the Glacier Hotel at Lake McDonald. The elevation of the one highest is about 7,800 feet; the other lake is about 75 feet lower. Each lake has an area of from 10 to 20 acres. They are fed by little streamlets coming from springs among the rocks on either side or from snowbanks. A small stream pours over the rocks at the edge of Sperry Glacier, the water from the stream really coming from the snow and ice of Sperry, although the movement of the ice and the general flow of the water is in the opposite direction.

The scenery at these lakes is very rugged and picturesque. On the west lies the bare and rocky summit of Edwards Mountain. At the foot of the cliffs of Edwards and close to both the lakes is the trail leading to Sperry Glacier. The color of these two lakes mentioned is generally a very deep blue. This changes as the light of the sun becomes stronger or weaker or is obstructed by intervening clouds.

These two little lakes are very attractive to tourists, and the trail past them is at present traveled more than any other one in the park. It doubtless will always be the most public trail, especially for those who come into the park by way of Belton. This is because the trail opens up, with a minimum of time and travel, one of the glaciers of the park and one of sufficient size to be of more than passing importance. The magnificent scenery is very attractive and can be reached in a few hours' walk from the hotel. On several occasions I have visited these two little lakes. In the summer of 1911 it was found possible to transport the canvas boat to their waters for the purpose of determining more exactly the depth of the water and the life it contains. The depth of the higher lake only was taken owing to lack of time. It was found that its greatest depth was 32 feet. By the use of the net and dredge the life of the lake was examined.

There are considerable quantities of fish food, and it is believed that quite a number of fish could maintain existence here. Owing to the high elevation of the lake and the lack of streams, either as inlets or as outlets, which would give opportunity for the fish to travel, they would be locked in the small lake itself. However, it would seem to be an experiment worth trying to introduce a few fish into each of these little lakes, as they undoubtedly could live, and as the lakes undoubtedly would not freeze to the bottom in winter. It would certainly add greatly to the interest and attractiveness of the trail to tourists if they could climb to this place, which appears to be impossible of ascent when viewed from below, and find at the



LAKES SOUTH OF SPERRY GLACIER. A PORTION OF EACH LAKE IS HIDDEN BY THE CLIFFS BETWEEN THE CAMERA AND LAKE.

very end of the trail and high up among the frightful rocks a body of water from which they could draw fish with a hook and line for the noonday meal. It is for this reason only that it is suggested as worthy of a trial, because the lakes are certainly not of sufficient size to maintain any great quantity of fish, and they never could get out.

Owing to lack of time soundings of the lower lake were not taken, but from its general appearance and the character of the rock it is probably not very much unlike the upper one. Previous observations tended to show that it contained about as much food or life as did the higher lake.

SUMMARY.

There are many other lakes in the park, some of them large, some of them small, which have not been studied. Many of these are removed from the trails, while some of them are close to present trails. Many of these lakes are already supplied with an abundance of fish. Still others are, by their location, and by the presence of falls between them and the lower waters, devoid of fish life. It is highly desirable that further study of these lakes should be made. Such study, doubtless, will be carried on in the near future.

With a pleasure ground of the area of this park, approximating, as it does, 1,500 square miles, with so many streams of water leading into the Atlantic, the Arctic, and the Pacific, and the wealth of magnificent scenery that the country affords, there will, doubtless, be many more trails made in the years to come than there are at present. Where hundreds of people now visit the park, thousands—perhaps tens of thousands—will visit it in the years to come. The introduction of fish into the various streams and lakes that will support fish life will make the park more attractive to tourists and render their stay more pleasant. The introductory work of placing fish in the streams and lakes is not very arduous and should be carried on now, so as to give time for the fish to grow and reach maturity before the heavy park traffic shall begin.





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